Mountain Regional Water Special Service District
Water System Efficiency Projects of 2011-12
Green Justification of the Proposed 2011 State/EPA Bond Projects

By Doug Evans Oct 2011

PROJECT SUMMARY:

PROJECT COMPONENET	Cost Estimate
1- On-site Chlorine Generation	95,000.00
2- New Plant Membrane Filter Skid	500,000.00
3- New Feed Pump for Plant Skid	20,000.00
4- Plant Chemical Storage Tank	6,500.00
5- Elevated Plant Mezzanine and Server Room	35,000.00
6- Raw Water Pond Control Valve Upgrade	10,000.00
7- Lost Canyon Pump Station Soft-Start Conversion	56,000.00
8- SCADA System Upgrade	250,000.00
9- Contingency 10%	97,250.00
10- Engineering	80,250.00
TOTAL:	1,150,000.00

DESCRIPTION and JUSTIFICATION:

1. **Signal Hill Treatment Plant On-Site Chlorine Generation System.** (See Green Strategy Items# 22 and 24) Mountain Regional Water District chose initially in 2003 to use on-site chlorine generation as an alternative to the possible hazards of delivering gaseous chlorine to our Signal Hill Water Treatment Plant. This plant is problematically located at the top of a mountain in the middle of a very large (1,600 unit) residential development and offers only residential type road access to the plant. Currently the system needs to be upgraded to a larger size and the system also has major components that are beginning to fail. The option of whether to purchase or produce sodium hypochlorite was considered, with the decision to stay with generated chlorine based on the following safety and green principles:
    a. **Safety.** The generator's dilute (0.8%) hypochlorite solution is below the hazardous material concentration threshold of 1%. This reduces operator HazMat exposure and eliminates the need for diluting commercial hypochlorite to compensate for degradation which results in inconsistent solution strength.
    b. **Fewer Deliveries**. The only chemical required for the generation process is common salt. This will reduce vendor deliveries by 66% vs. commercial bulk sodium hypochlorite. Less truck traffic through the residential community and at the treatment plant will reduce the potential for accidents and eliminate the associated carbon footprint. For example one load of salt is equal to five loads of commercial bleach. This furthers efforts towards Green Facility Management and improves the Water Security profile. Of all places this could be located in the

country - the Salt Lake City area is blessed with a never ending source of high quality salt at a very low and predictable price.

c. **Continuity of Operations**. Utilizing chlorine generation technology will enable storage of larger quantities of raw materials necessary for our disinfection process (salt). This will result in a more sustainable and robust treatment facility that is able to withstand the demands imposed by a natural disaster or health emergency. Manufacturers of this chlorine generation disinfection technology represent that their product enables compliance with the Department of Homeland Security recommendations for Pandemic Flu Planning Guidelines.

d. **Reduced Operational Costs**. Since all chlorine compounds are derived from salt, electrolytic conversion at the treatment plant will result in significant savings to the public. Typically it costs 50% less to produce sodium hypochlorite vs. buying it in bulk.

2. **New Plant Membrane Filter Skid.** (See Green Strategy items#'s 1,6,12,21, and 43) Mountain Regional Water recently upgraded its Signal Hill Water Treatment Plant to improve water quality and capacity using ARRA funds in 2009. This project improved treatment processes by adding pre-treatment chemical mixing and clarification, and post treatment activated carbon absorbers to reduce and/or eliminate TOC and other taste and odor problems associated with sources located on or near the Weber River and Rockport Reservoir. These improvements were all sized at 4 MGD capacity. The current plant membrane skids are sized at 3 MGD. Everything in the initial plant design as well as the recent ARRA improvements were designed and contemplated to add another 1 MGD membrane skid I the future. Adding an additional 1 MGD skid allows Mountain Regional to accomplish the following objectives during the peak demand season:

   a. **Redundancy**. The current layout of the plant offers very little redundancy when a membrane is down for maintenance or other malfunctions.

   b. **Rotation**. By adding a skid membrane, the plant can rotate through membranes, allowing a longer run cycle in a 24 hour period at a lower production, thus reducing the overall peak demand and increasing energy efficiency by not filling tanks as rapidly.

   c. **Off-Peak Production**. The actual plant's 24 hour production capacity needed will not reach 4 MGD for many years. By implementing a fourth 1 MGD membrane skid into the operation – the plant can now be run at a full 4 MGD capacity at night, during the 8 hour off peak Rocky Mountain Power demand period, and at only 1 MGD capacity or less during the other hours. This will average a 2 MGD production level (using current demands), while reducing or even eliminating most of the peak power demand at certain times of the year. This can reduce power costs significantly and reduce the demand of one of our biggest electrical facilities on the power grid at peak electrical periods.

3. **New Feed Pump for Plant Membrane Skid.** (See Green Strategy items #'s 6,8, and 12) This project is an additional component to project number 2 above. It includes a new submersible membrane feed pump (pump 3 of 3) along with a variable frequency drive to be added to the existing MCC. The wet well feed where the pump is housed as well as

the MCC panel is already sized for this pump in anticipation of the future plant membrane skid upgrade.

4. **Plant Chemical Storage Tank.** (See Green Strategy Item # 24) Mountain Regional is proposing to add a large bulk storage tank at the plant for the storage of Aluminumchlorohydrate (ACH). This chemical is used in the pretreatment phase of the process for coagulation. By storing more of this chemical on-site, we can significantly reduce the need for routine delivery of chemical storage totes, realizing better costs as well as a reduction in the transportation and associated energy costs of delivery. This project would also increase operator safety by reducing heavy tote storage, manipulations, and chemical transfers from one tote to another.

5. **Elevated Plant Mezzanine and Server Room.** (See Green Strategy Items #'s 46, 55, and 56) Mountain Regional Water currently stores spare parts and equipment all over the 30 square miles or more of its service area. This is mainly a result of the extreme cost in Summit County of land needed to house or yard such equipment. This project contemplates building a compact efficient equipment store in an unused higher level (out of any wet environs) within the current Signal Hill Treatment Plant. This new mezzanine area is relatively inexpensive and will make the operation of the plant and district much more efficient and functional. A small component of this project is to house a small server room in this elevated and secure location where the District's SCADA servers will be housed and managed.

6. **Raw Water Pond Control Valve Upgrade.** (See Green Strategy Item # 28) Key to providing a successful backup of water for the Signal Hill Water Treatment Facility is a 40 acre-foot raw water pond where water pumped from Rockport Reservoir is stored prior to treatment. If there is a leak or break in the main transmission feeding this pond from Rockport Reservoir, the District could risk losing all or a part of this critical storage. To protect this reservoir in the event of an emergency, an electrical operator will be installed on the 24 inch diameter knife gate valve at the pond. This valve will be closed if the updated SCADA system senses a loss of pressure on the transmission feed line or a loss of pond water when the system is not feeding water to it or drawing water into the plant. The Lost Canyon Booster Pump Station would also be shut down and be isolated to protect the pipeline when the valve is closed.

7. **Lost Canyon Pump Station Soft Start Conversion**. (See Green Strategy Items # 6, 8, 11, and 13) This project would significantly reduce energy and motor heat and noise at the 4,000 horsepower Lost Canyon Booster Station near Rockport Reservoir by switching the older Variable Frequency Drives, (VFD's) on pumps 1 through 7 to reduced voltage soft-starters (RVSS). The project would maintain all of the power factor correction capacitors to minimize any power factor charges levied by the power company. It is estimated that this project will save 7,200 watts per pump in heat loss coming from VFD's and Input Filters. When factoring in the entire pump station there will be over 50,000 watts conserved. This improvement will also allow the pumps to be run more efficiently at 60 Hz instead of 59, due to improperly installed harmonic filters, thus increasing the peak

pump station flows by nearly 700 gpm. Four of the used VFD's will be recycled and used on 200 horsepower pumps at the Old Ranch Road pump station to replace aging equipment there and to provide more efficient pump operation.

8. **SCADA System Upgrades.** (See Green Strategy Items # 23, 27, 43, 45, and 46) To implement much of the green strategies listed in our strategic plan, the District needs to do a major upgrade of its current SCADA system. The current system was installed in 2001 and served its purpose well to facilitate the proper enlargement and regionalization of the District, but it is now incapable of providing the type of control and monitoring needed to meet many of our green goals and objectives. It will be designed with the following strategic goals:
    a. **Pump Optimization.** Instead of conventional pump control – strictly based on a reservoir start or stop point, this system will be much smarter. Control will be triggered on multiple decision trees such as: can the pump(s) be run off-peak to preserve power load and costs? Or, can they be run at lower speeds or quantities over a much longer period to increase the load factor – reducing energy and peak demands?
    b. **Source Optimization.** Which wells and other sources can be run which are more economical at the given time of year?
    c. **Energy Management.** The system will be designed to monitor all energy and power parameters of pumping systems, to better allow staff to more effectively troubleshoots performance degradation or other related problems.
    d. **Operator Integration.** The system will be integrated more broadly – on iPads, smart phones, and remote computers – to better enable efficient operations and management. Trouble shooting will be easier with simpler graphics and reports.
    e. **Water Loss Detection.** The system will calculate more accurately daily system demands by area, enabling staff to determine if a water loss is occurring.
    f. **Asset Management and GIS Integration.** System will be integrated with other management systems to enable staff to maintain all existing and new assets at peak performance levels, based not just on dates, but usage metering, etc.
    g. **Customer Meter Integration.** The backbone will be Ethernet radio based, allowing capacity for future customer and master metering radio read integration.
    h. **Open Source.** All hardware and software will be open and non-proprietary, allowing for the future integration of other devices which may be provided by other vendors as technology improves.
    i. **Backup.** SCADA servers will be housed in a more protected environment and will have redundant failover servers, UPS's, and off-site backup to ensure hardware and software integrity.
    j. **Database Structure.** The SCADA database will be based on open SQL type standards and not proprietary databases, allowing for the integration of other software systems.
    k. **Security.** High level security devises will be integrated into the system to protect the monitored assets(s). All communication will be encrypted.

l. **Documentation.** All systems will be well documented with manuals, as-builts, documents, and PLC programs and software, better empowering staff training on the proper operation and maintenance of the system.
m. **Ease of Expansion.** The system will be easily expandable with no extra software upgrades or costs needed in the new facilities.

ALTERNATE PROJECTS IF FUNDS ARE REMAINING:

9. **Demand Metering Projects.** (See Green Strategy Item # 27) Mountain Regional has absorbed some older developments that have poorly installed water distribution systems. The one that has the most problems in the District is the Summit Park system. This system has so many major water main leaks and breaks that our operational staff spend at least one or more days a month performing repairs on this system. A major part of District's unaccounted for water is lost in this system alone. The District is proposing that monies left over from the above projects be used to install newer technology (radio read equipment) MXU's on a critical sub-set of the customer meters in Summit Park, along with any appurtenant equipment, needed to facilitate the operation of such a system. This system would query each meter and would transmit hourly data in the daily read.

   We would install this system on one or more isolated pressure zones in Summit Park. The zone or zones where these MXU's would be installed in would be accompanied by a corresponding installation of a master meter feeding such zones. This meter would also be read in the same intervals, and the differences in the reads would be continually presented on our SCADA system for review and evaluation – to determine when and possibly where the brake or leak occurred. This would allow the District to make speedy repairs – minimizing water losses and associated costs and property damages. The advantage of holding this project to the end is that it could be customized to any size needed, commensurate with any funds remaining.